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GB 2140315 A US 4289065 A US 3373680 A
US 3126820 A

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(54) **Screw presses**

(57) A screw press has a mechanical screw surrounded by a cage. The cage 20a includes a number of longitudinally extending circumferentially spaced bars 23 with a spacing being chosen so that the liquid phase of a material can be passed between the bars as the material is squeezed by the press. The bars are spaced by shims 28 that are mounted on the bars prior to the installation of the bars in the cage. This allows the rapid and easy assembly of the cage and allows the spacing of the bars to be altered as required.

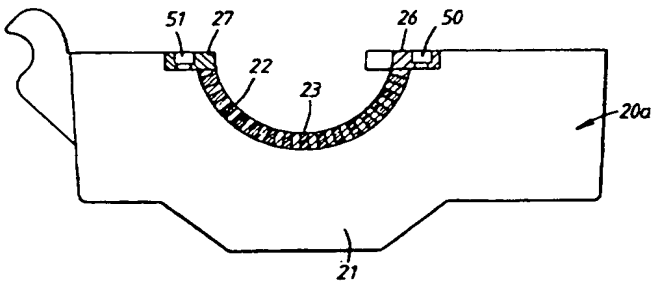

Fig.2

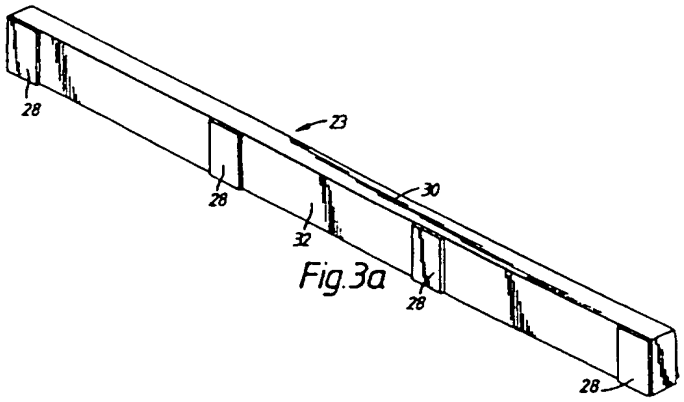

Fig.3a

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

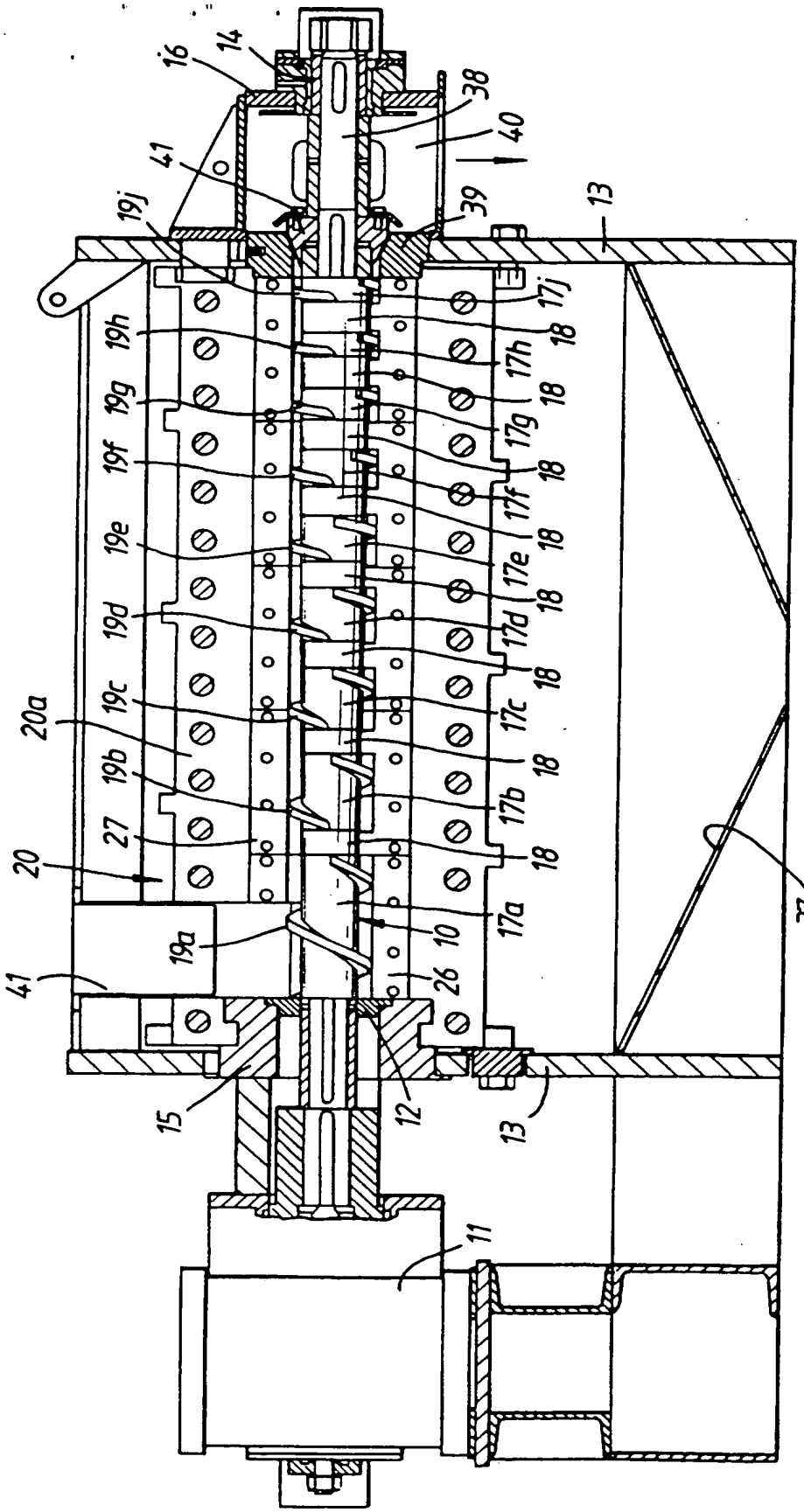

Fig.1

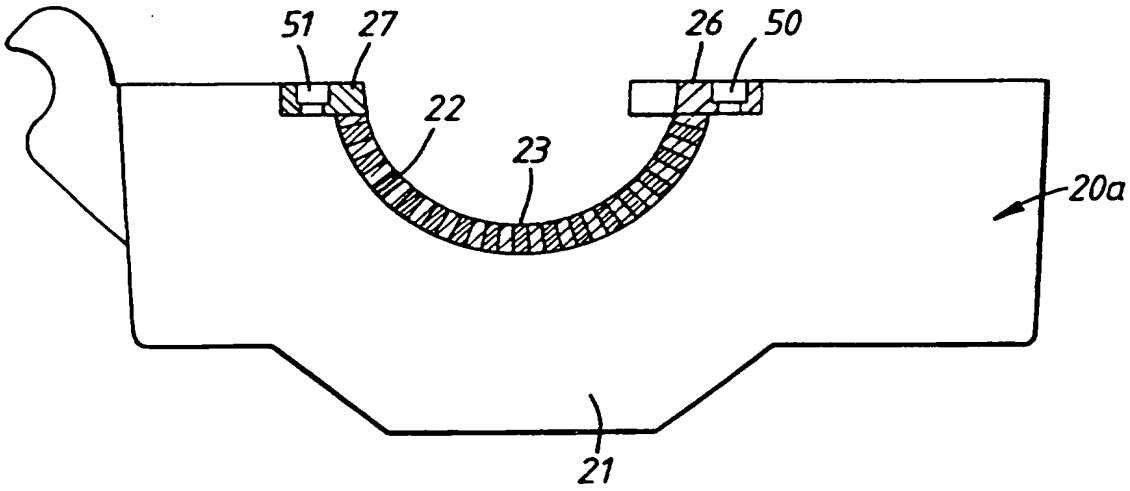

Fig.2

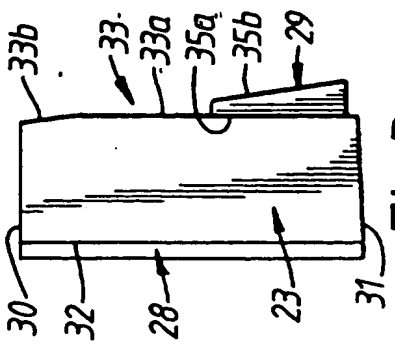

Fig.3c

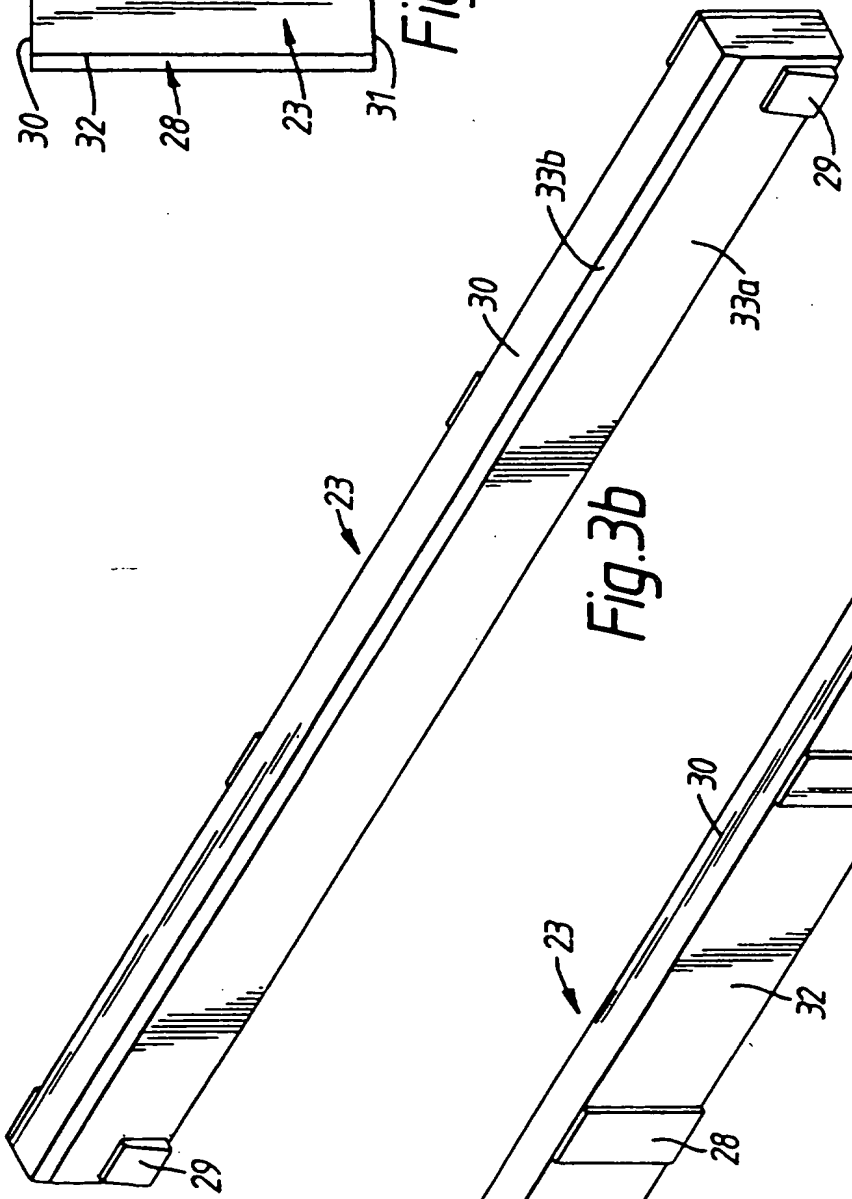

Fig.3b

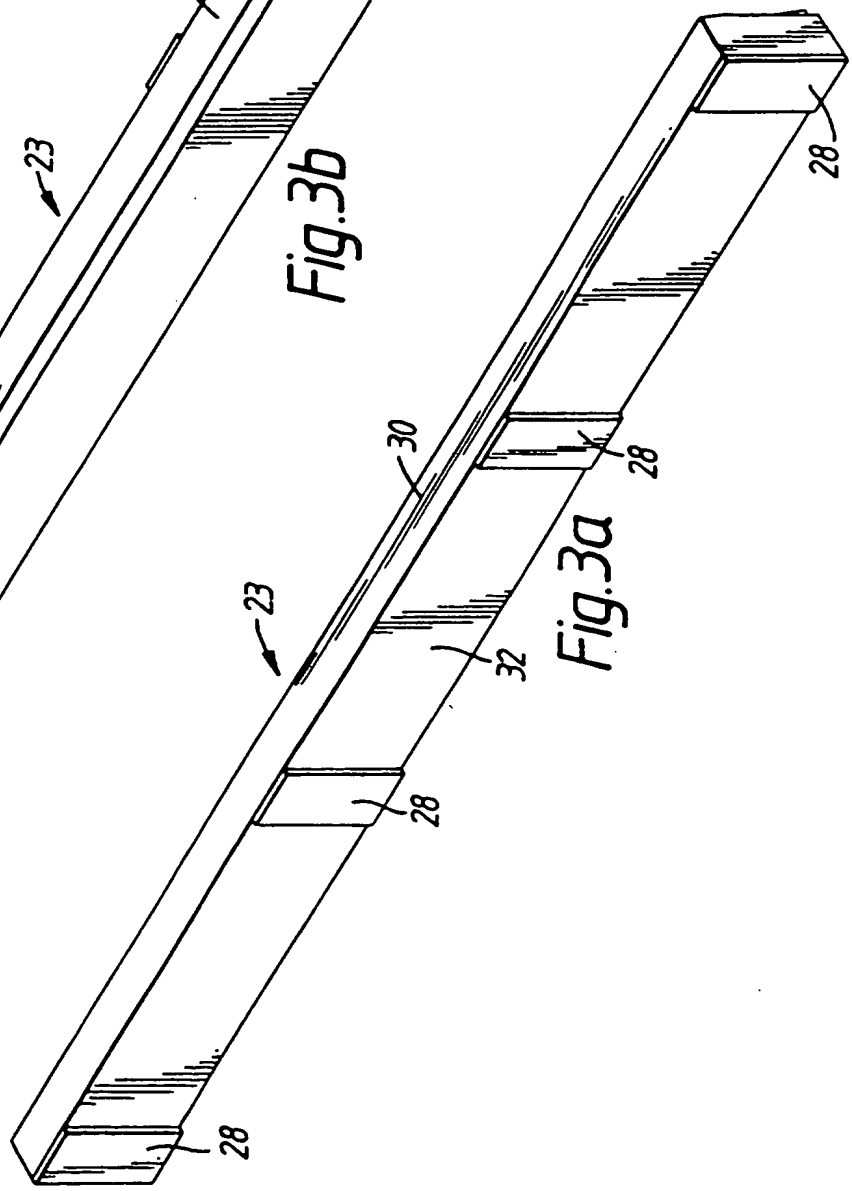

Fig.3a

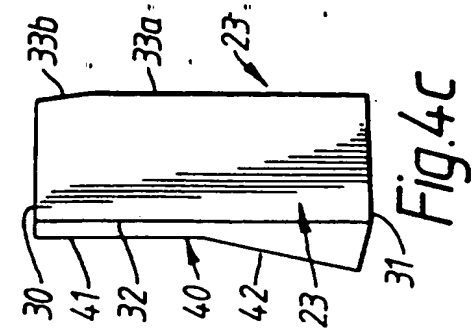

Fig.4c

Fig.4b

Fig.4a

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SCREW PRESSES

The invention relates to screw presses and more particularly to mechanical screw presses for a continuous separation of liquid and solid phases of vegetable or animal material.

In general, such screw presses comprise a mechanical screw surrounded by a cage formed by a plurality of circumferentially spaced axially-extending bars. Each bar is spaced circumferentially from the next adjacent bar by a spacer so that liquid phase leaves the mechanical screw via the gaps formed between these bars.

The single press may contain several hundred such bars whose form, material and circumferential spacing are all critical to the efficiency of a particular pressing operation. As a result of the diversity of materials a particular type of press may be called upon to process, the detailed geometry and material of the bars will differ from press to press.

According to a first aspect of the invention, there is provided a screw press comprising a mechanical screw surrounded by a plurality of circumferentially spaced axially extending bars carried by a support, each bar being circumferentially spaced from a next adjacent bar by at least one separately formed spacer, said at least one spacer being connected to the associated bar prior to positioning of the bar in the support.

According to a second aspect of the invention, there is provided a method of assembling a screw press having a

mechanical screw surrounded by a plurality of circumferentially spaced axially extending bars carried by a support, comprising the connection of at least one spacer to each bar, installing the bars in the support such that each spacer spaces circumferentially the associated bar from a next adjacent bar.

The following is a more detailed description of an embodiment of the invention, by way of example, reference being made to the accompanying drawings in which:-

Figure 1 is a longitudinal cross-section of a screw press,

Figure 2 is a cross-sectional view of a cage of the screw press of Figure 1, and

Figure 3a shows one side of a bar carrying spaced shims,

Figure 3b shows an opposite side of the bar of Figure 3a carrying spaced wedge spacers,

Figure 3c shows an end view of the bar of Figures 3a and 3b carrying shims and wedges,

Figure 4a shows one side of a bar carrying spaced shim/spacers,

Figure 4b shows an opposite side of the bar of Figure 4a, and

Figure 4c shows an end view of the bar of Figures 4a and 4b carrying shim/spacers.

Referring first to Figure 1, the screw press comprises a mechanical screw 10 connected at one end, via a gearbox 11, to a prime mover such as an electric motor 11 for rotating the screw 10. The screw 10 is supported for rotation in a first bearing 12 adjacent the motor and carried by a frame 13. An

outlet 40 is provided at the other end of the screw 10 and includes a second bearing 14 supporting rotatably the other end of the screw 10.

The first bearing 12 is mounted in an annular support 15 carried by the frame 13. The outlet 40 includes a plate 16 that carries the second bearing 14.

The screw 10 has an operative section formed by a plurality of segments 17a,17b,17c,17d,17e,17f,17g,17h,17j. Each segment is separated from the next adjacent segment by a distance piece 18. Each segment includes an helical thread 19a,19b,19c,19d,19e, 19f,19g,19h,19j. The threads have progressively smaller pitches from the drive end of the screw 10 to the outlet end of the screw 10. In addition, the boss diameters of the threads may increase in the same direction.

The screw 10 is surrounded by a cage 20 formed by two half-cages, one of which is shown at 20a in Figure 1 and Figure 2. Each half-cage 20a comprises a mounting 21 having a semi-circular cavity that fits around the screw 10 and supports a plurality of axially-extending circumferentially spaced lining bars. At one circumferential end of the cavity there is a knife bar 26 and at the other circumferential end of the cavity 22 there is a shoe frame bar 27.

The knife bar 26 and the shoe frame bar 27 are diametrically opposite one another and are screwed to the half-cage 20a by respective screws, 50,51. The number of lining bars 23 and their spacing (which will be discussed below) are chosen such that when the knife bar 26 and the frame bar 27 are screwed to

the half-casing 20a, the lining bars 23 are clamped between these bars 26,27 to hold them in position.

It will be appreciated that the half-cage 20a holds a number of end-to-end sets of bars of the kind described above with reference to Figures 1 and 2. As shown in Figure 1, there are five such sets.

The lining bars 23 are spaced circumferentially to provide a liquid flowpath from the screw 10. This spacing is achieved by shims 28 between adjacent lining bars 23. There are also wedge spacers 29 that help in the assembly of the bars 23. These are formed in the following way.

Each lining bar 23 has parallel spaced upper and lower surfaces 30,31 and spaced first and second side surfaces 32,33. The first side surface 32 is planar typically but nor necessarily lying in a plane normal to either the plane of the upper or lower surfaces 30,31. The second side surface 33 has a major portion 33a typically lying in a plane parallel to the plane of the first side surface 32. However, adjacent the upper surface 30, the second side surface 33 includes a chamfered surface 33b. The angle of the chamfered surface 33b is chosen in accordance with the diameter of the cavity 22.

The first side surface 32 carries four spaced shims 28. Each shim 28 is rectangular in shape and has a thickness chosen to give the bars a required spacing when assembled into the cavity 22, having regard to the material that the press has been designed to process. Each shim 28 extends between the upper and lower surfaces 30,31 of the associated bar 23.

The second surface of each bar 23 carries two wedge spacers 29, one at each end of each bar 23. Each wedge spacer 29 (see Figures 3b and 3c) has a cross-section that is the shape of a truncated triangle with spaced sides 35a,35b having an angle between them related to the required positioning of the bar 23 and the cavity 22. Each wedge spacer 29 is adjacent the lower surface 33 of the associated bar 28 and extends only a short distance up the second surface 33 of each bar.

The shims 28 and the wedge spacers 29 are fixed to the associated bar by any suitable means, such as an adhesive.

The bars 23 are then assembled into the cavity 22 with each bar 23 extending in an axial direction and being spaced from the next adjacent bars 23 by the shims 28 and the wedge spacers 29. Each bar 23 is arranged with the upper surface 30 as the radially inner surface and the lower surface 31 as the radially outer surface. Thus the wedge spacers 29 hold the radially outer ends of the bars 23 in a required relative spacing and resist any tendency of the bars 23 to twist or topple over. This is an advantage over previous proposals where the bars are provided with a broad lower surface to prevent such toppling on assembly. As well as requiring precision machining to form a broad lower surface, such bars must be machined with drainage channels for the flow of liquid between the bars, because the presence of a broad lower surface reduces significantly the gaps between adjacent bars.

The shims 28 contact the chamfered surface 33b of the next adjacent bar and act principally to determine the relative spacing between the radially inner ends of the bars 23 and so

define the gaps between adjacent bars 23 for the outflow of liquid. The fact that the shims 28 and the wedge spacers 29 are connected to the bars 23 prior to their insertion into the cavity 22 means that no adjustment is necessary once insertion has taken place. In addition, as compared with bars that are machined in one piece to an exact required size and with specific features to aid drainage, the bars 23 require no such exact machining which is expensive and time consuming.

The wedge spacers 29 are not subjected to any significant compressive loads and can therefore be made conveniently and cheaply from a material with a relatively low elastic modulus such as synthetic polymer. The shims 28 may be made from a high elastic modulus material such as steel.

After being arranged in the cavity, along with the other bars 24,25,26,27, the knife bar 26 and the frame bar 27 are screwed to the half-cage 20a and the lining bars 23, clamped in position. The other half-cage (not shown) is assembled in a similar manner. The half-cages may have cavities 22 that vary in diameter along their lengths to match the variations in the thread diameters along the length of the screw.

The two half-cages are then clamped together around the mechanical screw 10. The knife bars 26 have knives 36 that project radially inwardly and are axially aligned with the distance pieces 18. A liquid collection trough 37 is located beneath the cage for catching liquid extracted by the screw 10. At the outlet end, the screw 10 has a tapered extension 38 beyond the final segment 17j that passes through an annular plate 39 and through an outlet zone 40 to the second bearing

14 on the second support 16. A choke 41 is carried by the screw 10 adjacent the plate 39 to control the back pressure in the cage and compaction of the cake produced by the pressing process. An inlet 41 extends radially through the cage 22 at the inlet end of the screw 10 to connect with the first segment 17a.

In use, the screw 10 is rotated by the prime mover via the gear box 11. Vegetable or animal matter is fed through the inlet 41 to the operative section of the screw 10 where it is advanced by the threads 19a,19b,19c,19d,19e,19f,19g,19h,19j towards the outlet zone 40. The decreasing pitch of the threads and the increasing diameter of the thread bosses applies increasing pressure to the matter as it passes along the screw 10. Liquid extracted from the matter passes between the bars 23 and into the trough 37. Plainly, the spacing of the bars 23 must take account of the nature of the material being pressed and its characteristics once pressed to ensure that the liquid and solid phases are fully separated.

It will be appreciated that the wedged spacers 29 may be omitted, particularly where twisting of the bars 23 is not a problem.

It will also be appreciated that more or less shims 28 and more or less wedge spacers 29 may be provided on each lining bar 23. The wedge spacers 29 may be used separately from the shims 28 and vice versa. Further, the wedge spacers 29 may be attached to the same side of the associated lining bar 23 as the shims 28.

The wedge spacers 29 may be formed in one piece with the shims 28. An example of this is shown in Figure 4a, 4b and 4c in which parts common to these Figures and to Figures 3a, 3b and 3c are given the same reference numerals and are not described in detail.

In this arrangement, each bar 23 has four shim/spacers 40 spaced along the side surface 32 of the bar 23. Each shim/spacer 40 is generally rectangular in shape with a planar near surface attached to the side surface 32 of the bar 23. The opposite front surface of each shim/spacer 40 has a first planar portion 41 parallel to the rear surface (and forming a shim) and a second planar portion 42 inclined at an angle to the first planar portion 41 (and forming a wedge).

As seen in Figure 4a, each shim/spacer 40 extends over the whole depth of the side surface 32 between the upper and lower surfaces 30,31.

In use, the lining bar 23 and shim/spacers 40 are assembled in the cavity as described above with reference to the drawings. The second planar portions 41 hold the radially outer ends of the bars 23 in a required relative spacing and resist any tendency of the bars 23 to twist or topple over. The first planar portions 41 act principally to determine the relative spacing between the radially inner ends of the bars 23 and so define the gaps between adjacent bars for the outflow of liquid.

The shim/spacers 40 may be formed as a single integral element or may be formed from two or more components connected together.

Of course, the screw press described above with reference to the drawings is only one of a number of different constructions of screw press including lining bars. The spacing system described above with reference to the drawings may be applied to any suitable such screw press.

CLAIMS

1. A screw press comprising a mechanical screw surrounded by a plurality of circumferentially spaced axially-extending bars held by a support, each bar being circumferentially spaced from a next adjacent bar by at least one separately formed member, said at least one member being connected to the associated bar prior to the positioning of the bar in the support.

2. A screw press according to claim 1 wherein a plurality of said members are provided connected on each bar at axially spaced intervals there along.

3. A screw press according to claim 1 or claim 2 wherein the or each member is connected to the associated bar by an adhesive.

4. A screw press according to any one of claims 1 to 3 wherein the or each member comprises a shim connected to a radially extending surface of the associated member and contacting a radially inner end of the next adjacent bar to fix the circumferential spacing between the radially inner ends of adjacent bars.

5. A screw press according to any one of claims 1 to 4 wherein each bar has a radially inner end and a radially outer end, the or each member comprising a spacer separating the

radially outer ends of the bars to position said bars relative to one another as said bars are positioned in said support.

6. A screw press according to claim 5 when dependent on claim 4 wherein each bar has two circumferentially spaced generally radially extending surfaces, at least one shim being connected to one of said surfaces and the other of said surfaces having at least one second spacer connected thereto prior to positioning of the bar in the cage.

7. A screw press according to claim 6 wherein said at least one second spacer has a cross-section in planes in normal to the screw axis that is a truncated wedge.

8. A screw press according to any one of claims 5 to 7 wherein the at least one spacer is located at a radially outermost edge of said second surface.

9. A screw press according to any one of claims 5 to 8 wherein said at least one spacer is made of a synthetic polymer.

10. A screw press according to claim 4 wherein the or each shim is made of metal.

11. A screw press according to claim 5 when dependent on claim 4 wherein each bar has two circumferentially spaced generally radially extending surfaces, at least one element

forming a shim and a spacer being connected to one of said surfaces.

12. A screw press according to claim 11 wherein the or each element is generally rectangular in shape with a planar rear surface attached said surface of the associated bar and an opposite front surface having a first planar portion parallel to said rear surface and forming said shim and a second planar portion inclined at an angle to the first planar portion and forming said spacer.

13. A screw press substantially as hereinbefore described with reference to the accompanying drawings.

14. A method of assembly a screw press having a mechanical screw surrounded by a plurality of circumferentially spaced axially-extending bars carried by a support comprising the connection of at least one member to each bar, installing the bars in the support such that each spacer spaces circumferentially the associated bar from the next adjacent bar.

15. A method according to claim 14 comprising clamping said bars in said support, the bars being relatively positioned by second spacers between said bars prior to said clamping.

16. A method of assembly a screw press substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

14

Application number
GB 9416069.4

Relevant Technical Fields

(i) UK Cl (Ed.N) B5F (F1C); B1D (DHAX)

(ii) Int Cl (Ed.6) B30B (9/02, 9/12, 9/14, 9/16, 9/18)

Search Examiner
P G BEDDOE

Date of completion of Search
18 APRIL 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI, CLAIMS

Documents considered relevant following a search in respect of Claims :-
1-16

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2140315 A	(MASCHINENBAU) see especially Claim 1; Figures 1, 2; Page 4 lines 23 to 52	1, 14
X	US 4289065	(FRENCH OIL) see especially column 2 line 53 to column 3 line 8	1, 14
X	US 3373680	(FRENCH OIL) see especially column 3 lines 29 to 36; Figures 2, 3	1, 14
X	US 3126820	(FRENCH OIL) see especially column 3 lines 7 to 24; Figures 2, 3	1, 14

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).